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(56) Documents Cited  
GB 2309165 A GB 2103798 A

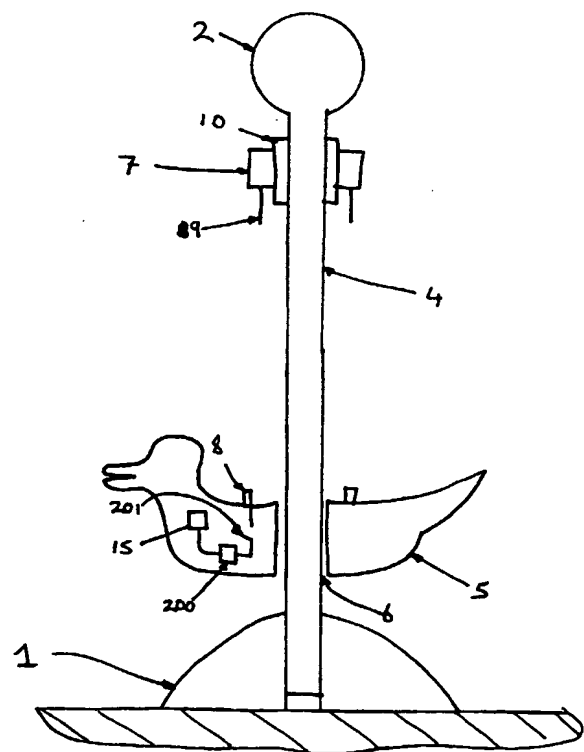
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**(54) Abstract Title**  
**Water level sensor**

**(57) A sensor assembly for sensing water level in a bath, the sensor assembly comprising**

- a) a base (1) for mounting the assembly in a bath,
- b) an arm (4) projecting from the base,
- c) a float (5) carried on the arm and movable along the axial length thereof,
- d) a signal generator (15) for generating a visual or audio signal, and
- e) means for actuating the signal generator when the float has moved to a predetermined point along the arm.

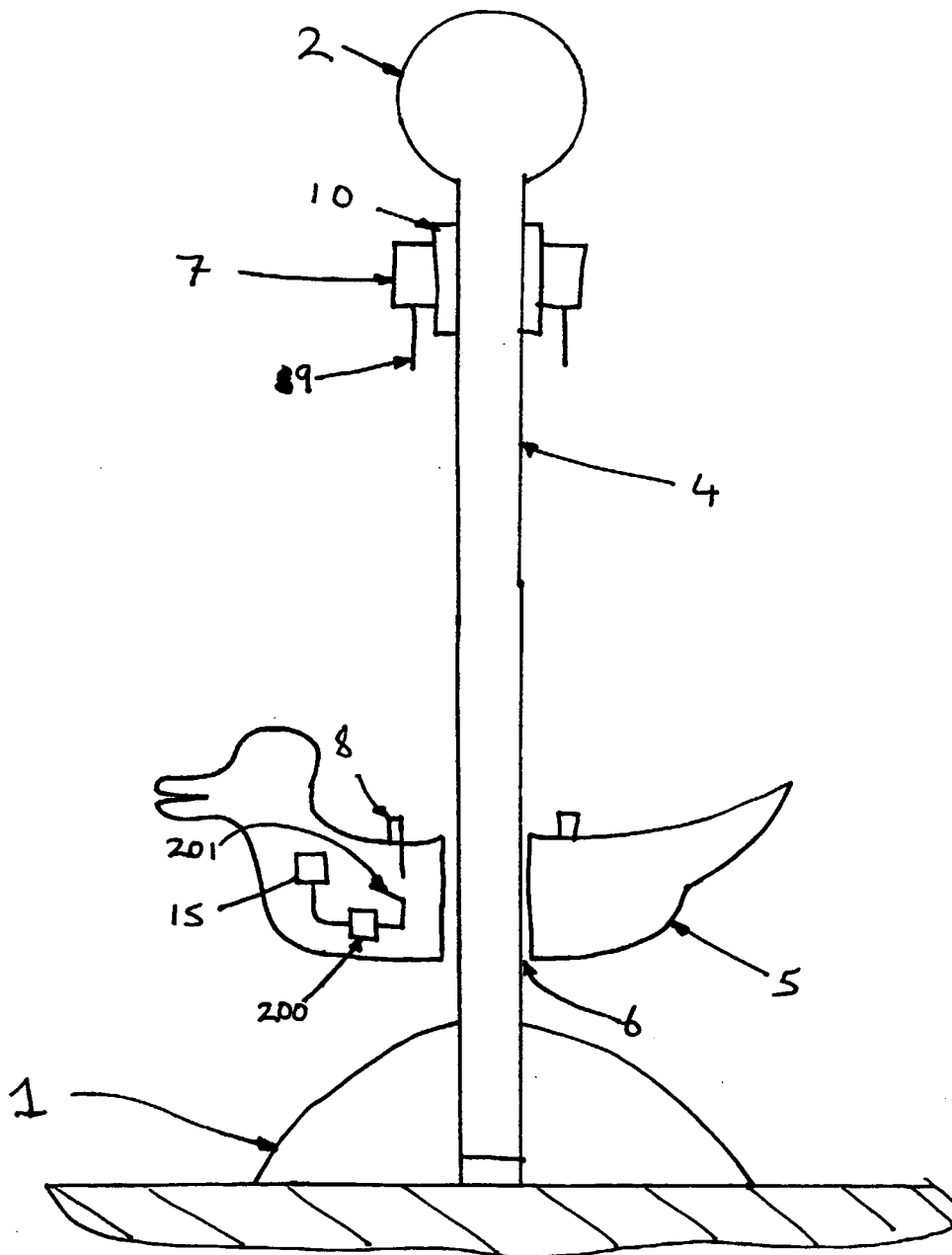
Figure 1



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Figure 1



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Figure 2

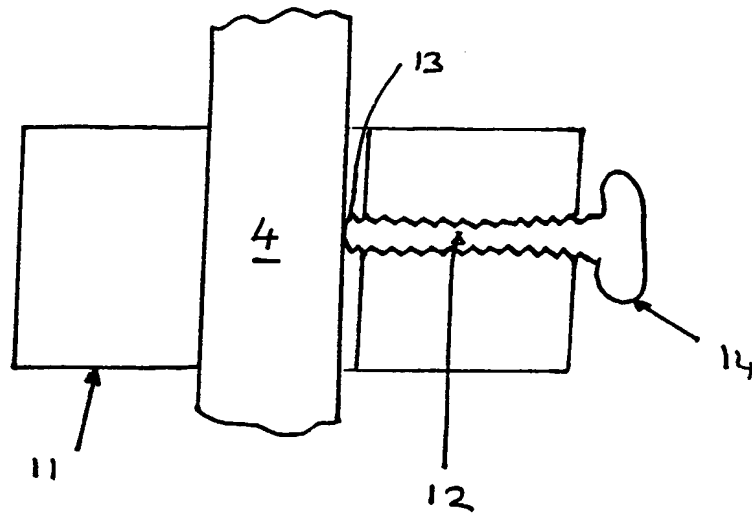
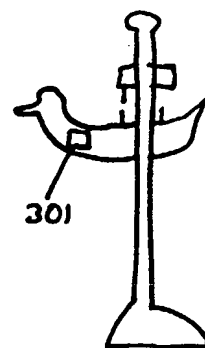


Figure 3



1                                   **Water level sensor**

2

3   This invention relates to water level sensors primarily  
4   but not exclusively for use in sensing water levels in  
5   baths.

6

7   Overflowing baths can cause major damage to the  
8   building in which they are situated. A number of  
9   devices have been proposed to attempt to deal with  
10   this problem by opening valves to allow excess water  
11   to pass to waste. One of the better designed examples  
12   of this is shown in WO95/18896. This class of devices  
13   is not wholly satisfactory since with wear the device  
14   may leak leaving the user high and dry. Other less well  
15   designed devices may not be capable of disposing of  
16   the high volumes of water entering the bath.

1

2 According to the invention there is provided a sensor  
3 assembly for sensing water level in a bath, the sensor  
4 assembly comprising

5 a) a base for mounting the assembly in a  
6 bath,

7 b) an arm projecting from the base,

8 c) a float carried on the arm and movable  
9 along the axial length thereof,

10 d) a signal generator for generating a visual  
11 or audio signal, and

12 e) means for actuating the signal generator  
13 when the float has moved to a  
14 predetermined point along the arm.

15

16 In some embodiments of the invention the float  
17 comprises a model of an object. The object can be

1   animate for example a duckling or a frog. In some  
2   embodiments of the invention the animate object is a  
3   duck and the visual or audio signal comprises an  
4   audio representation of a quack. Some embodiments of  
5   the invention further comprise a stop which the float  
6   abuts to actuate the signal generator. Some  
7   embodiments of the invention further comprise a stop  
8   which the float approaches to actuate the signal  
9   generator. In some embodiments of the invention each  
10   of the float and the stop carries a pair of contacts such  
11   that abutment of the float and the stop completes a  
12   electrical circuit actuating the signal generator. In some  
13   embodiments of the invention one of the float and stop  
14   has a switch mounted thereon which is actuated by  
15   abutment of the float and stop. One of the float and  
16   stop can carry a reed switch and the other of the stop  
17   and float can carry a magnet to actuate the reed switch.

1 In some embodiments of the invention one of the float  
2 and stop carries a Hall effect switch and the other of  
3 the stop and float carries a magnet to actuate the Hall  
4 effect switch.

5

6 Embodiments of the invention will be described by  
7 way of non-limiting example with reference to the  
8 accompanying figures of which

9 Figure 1 is a sectional view of an embodiment;

10 Figure 2 is a scrap sectional view of a support; and

11 Figure 3 is a block diagram of a further embodiment.

12 The first embodiment comprises a dense base 1 for  
13 positioning the device on the bath floor. Desirably the  
14 base will comprise a plastics material to reduce the  
15 possibility of abrasion and damage of the bath or user.

16 In the illustrated embodiment the base comprises a

1 piece of plastics material loaded with a dense material.  
2 In the illustrated embodiment the base 1 is conical.  
3  
4 Received in the base is arm 4. Arm 4 is again  
5 conveniently of plastics material but this is not  
6 essential and other materials for example stainless steel  
7 or aluminium could be used. Arm 4 could be moulded  
8 into base 1 Arm 4 could be a push fit in the base 1 or it  
9 could be screwed into base 1. Those skilled will be able  
10 to devise other ways of mounting the arm on the base.  
11 Arm 4 is rigid and of generally uniform cross section  
12 so that float 5 to be described hereinafter in more  
13 detail can slide up and down the arm. Arm 4 in the  
14 illustrated embodiment extends generally  
15 perpendicularly to the base but exact perpendicularity  
16 is not essential. The free end of the arm may be  
17 provided with a ball 2 to reduce the likelihood of



1 injury. Those skilled in the art will be able to devise  
2 other ways of reducing the likelihood of spiking  
3 injuries to those who may fall on the device of the  
4 invention.

5

6 Float 5 is provided. Float 5 is provided with a hole 6  
7 through which arm 4 can extend allowing the float to  
8 move freely along the arm. Float 5 should be buoyant  
9 in water. Those skilled will have little difficulty in  
10 devising suitable materials for the construction of float  
11 5. Examples include wood cork and hollow metal. In  
12 many cases plastics material which may or may not be  
13 hollow will be used.

14

15 In the illustrated embodiment the float 5 comprises a  
16 representation of a duck. It will be apparent that the  
17 invention is not so limited. Alternatives will be

1 discussed hereinafter by reference to other  
2 embodiments of the invention.

3

4 Stop 7 is provided on arm 4. In preferred embodiments  
5 of the invention stop 7 is movable along arm 4. As will  
6 become apparent this allows the depth of water sensed  
7 to be varied. In other embodiments of the invention  
8 stop 7 is fixed. Those skilled will have no difficulty in  
9 devising methods of providing stop 7 with means for  
10 being fixed and movable when desired. In the  
11 embodiment of Figure 1 stop 7 is provided with a  
12 resilient portion 10 which extends around the arm 4  
13 gripping the arm and restricting accidental movement  
14 yet allowing the user to position the stop as desired.  
15 Those skilled in the art will have no difficulty in  
16 devising other ways of mounting the stop for example  
17 by providing the stop with a bush 11 which receives

1 the arm. Bush 11 is provided with a screw threaded  
2 portion into which is received screw threaded fastener  
3 12 with tip 13 and head 14. Tightening the screw  
4 threaded fastener urges tip against the arm and  
5 causing the stop to be fixed relative to the arm. Arm 4  
6 could be screw threaded and co-operate with a screw  
7 threaded stop. Desirably the float is completely  
8 removable from the arm (a reason for this will be given  
9 hereinafter) this could be achieved by making arm 4  
10 removable from the base or the stop from the arm.

11

12 Float 5 co-operates with stop 7 so that when float 5  
13 abuts stop 7 or reaches within a predetermined  
14 distance of stop 7 a signal is generated. Those skilled  
15 will have no difficulty in devising suitable ways of  
16 achieving this. In the embodiment of Figure 1 float 5 is  
17 provided with contacts 8. When contacts 8 abut

1 complementary contacts 9 of the stop a signal is  
2 generated as will be described hereinafter in more  
3 detail. In some embodiments of the invention as for  
4 example in that of figure 1 two spaced apart contacts  
5 are provided. Bath water has a degree of electrical  
6 conductivity. The degree of conductivity depends on  
7 many factors including the amount of some hardness  
8 inducing agents, the presence of bath salts or ionic  
9 surfactants. By spacing the contacts apart accidental  
10 actuation due to electricity being conducted by surface  
11 films can be reduced.

12

13 It is not essential that electricity passes through the  
14 float and stop. For example one of the stop and float  
15 could be provided with a microswitch which could be  
16 actuated by the other of the float and stop abutting it.

1  
2 Physical contact between the float and the stop are not  
3 essential. Those skilled in the art will have no difficulty  
4 in devising cheap and effective ways of achieving this.  
5 Examples include providing one of the float and the  
6 stop with a reed switch or a Hall effect switch and the  
7 other of the stop and float with a magnet. These  
8 arrangements may be preferred since they are not  
9 affected by the variable conductivity of bath water. In  
10 some cases the switch will then be actuated without  
11 physical contact between the float and the stop. Those  
12 skilled will be able to devise other methods of  
13 achieving this result.

14  
15 Actuation of the signal generator 15 by abutment to or  
16 proximity with the float and stop causes a signal to be  
17 generated. In some embodiments of the invention this

1 is simply an audio or visual signal such as an alarm  
2 buzzer or lights. In other embodiments of the  
3 invention more distinctive signals are generated. For  
4 example in the embodiment of figure 1 signal  
5 generator 15 could generate a duck quacking sound  
6 alternatively or additionally the duck's eyes could light  
7 or flash.

8  
9 The skilled worker will have no difficulty in  
10 generating duck quacking sounds. The use of such a  
11 sound has a number of useful benefits. First duck  
12 quacks are fairly unusual sounds in most domestic  
13 environments. If the sound is heard it will likely  
14 impinge on a user's consciousness fairly quickly.  
15 Secondly the novelty value of a quacking duck may  
16 encourage an otherwise reluctant bather to bathe so as  
17 to hear the quacking sound.

1

2 As previously explained in some embodiments of the  
3 invention the float is removable from the rest of the  
4 device. This allows the float to be removed and used as  
5 bath toy when not being used to sense water depth.

6

7 A large number of modifications will suggest  
8 themselves to the skilled. In particular it is not  
9 essential that the float be in the form of a duck. An  
10 alternative could be a frog. Once again the distinctive  
11 and penetrating croak of a frog provides a good  
12 warning. It is not essential that water loving animals or  
13 animals at all be used as floats. For example the float  
14 could be in the form of a ship and the penetrating and  
15 distinctive sound of a ship's klaxon or foghorn used.  
16 Of course it is not essential that the float be in the form  
17 of an object having any connection with water be used.

1 The float could for example be in the form of whatever  
2 characters or objects which are the latest subject of cult  
3 interest.

4

5 In the embodiment of figure 1 the signal generator is  
6 carried within the float 5. A power supply for example  
7 a small battery 200 is provided with the float. In some  
8 embodiments of the invention the battery 200 is sealed  
9 within the float and replacement is not possible. This is  
10 advantageous in that there is less likelihood of water  
11 ingress with consequent disruption. The float will  
12 however be of limited life as a component of the sensor  
13 arrangement. However once the battery 200 is  
14 exhausted the float need not be discarded but can be  
15 used as a toy in or out of the bath. In some  
16 embodiments of the invention the float is provided  
17 with a switch 201 for connecting the battery to the



1 sound generator. The switch may be a press switch  
2 and may be actuated by squeezing the float if the float  
3 is made of resilient material. It may be desirable to  
4 provide an indication that the sound generator is  
5 powered such as lights in the eyes of animate objects.

6

7 In other embodiments of the invention the signal  
8 generator is not included within the float but rather is  
9 associated with the stop.

10

11 In many embodiments of the invention the signal  
12 generator is local to the sensor assembly. It is however  
13 within the scope to have a repeater unit 300 repeating  
14 the signal at a distant location. This distant location  
15 may be the only location at which the signal is  
16 detectable by unaided humans. For example signal  
17 generator 301 may generate a low power radio signal

1 which is transmitted to repeater unit 300 which may be  
2 in another room. Repeater unit 300 produces a signal,  
3 for example visual or aural, in response to the output  
4 from the signal generator 301.

5

6 While described by reference to a bath it will be  
7 apparent to the skilled that the invention could be used  
8 in sinks.

9

10

11 Those skilled in the art will have no difficulty in  
12 devising modifications. In particular it will be  
13 apparent to the skilled that float 5 need not be  
14 prevented from moving beyond the point at which the  
15 signal generator is actuated. This could be achieved by,  
16 for example, providing the arm with a magnetised  
17 portion and the float with a Hall effect switch. As the

1 Hall effect switch approaches the magnet the switch is  
2 actuated but the float can continue to rise. It is clear  
3 that in this embodiment there is not a stop. In this  
4 arrangement it would be desirable to toggle the signal  
5 generator since otherwise as the float moved further  
6 up the arm the Hall effect switch would no longer  
7 detect the magnet field and the signal generator would  
8 switch off.

1   **Claims**

2

3   1.   A sensor assembly for sensing water level in a  
4       bath, the sensor assembly comprising

5               a) a base for mounting the assembly in a  
6               bath,

7               b) an arm projecting from the base,

8               c) a float carried on the arm and movable  
9               along the axial length thereof,

10              d) a signal generator for generating a visual  
11              or audio signal, and

12              e) means for actuating the signal generator  
13              when the float has moved to a  
14              predetermined point along the arm.

15   2. A sensor assembly as claimed in claim 1 wherein the  
16       float comprises a model of an object.

1 3. A sensor assembly as claimed in claim 2 wherein the  
2 object is animate.

3 4. A sensor assembly as claimed in claim 3 wherein the  
4 animate object comprises a duckling or a frog.

5 5. A sensor assembly as claimed in claim 4 wherein the  
6 animate object is a duck and the visual or audio  
7 signal comprises an audio representation of a quack.

8 6. A sensor assembly as claimed in claim 1 further  
9 comprising a stop which the float abuts to actuate  
10 the signal generator.

11 7. A sensor assembly as claimed in claim 1 further  
12 comprising a stop which the float approaches to  
13 actuate the signal generator.

14 8. A sensor assembly as claimed in claim 6 wherein  
15 each of the float and the stop carries a pair of  
16 contacts such that abutment of the float and the stop

1 completes a electrical circuit actuating the signal  
2 generator.

3 9. A sensor assembly as claimed in claim 6 wherein one  
4 of the float and stop has a switch mounted thereon  
5 which is actuated by abutment of the float and stop.

6 10. A sensor assembly as claimed in claim 7 wherein  
7 one of the float and stop carries a reed switch and  
8 the other of the stop and float carries a magnet to  
9 actuate the reed switch.

10 11. A sensor assembly as claimed in claim 7 wherein  
11 one of the float and stop carries a Hall effect switch  
12 and the other of the stop and float carries a magnet  
13 to actuate the Hall effect switch.

14 12. A sensor assembly substantially as described herein  
15 by reference to any one or more of the accompanying  
16 figures



Application No: GB 0027702.0  
Claims searched: 1-12

Examiner: D. Haworth  
Date of search: 1 February 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4N (N3F2); G1H (H4A1, H4B1)

Int Cl (Ed.7): G01F 23/60, 23/68, 23/76

Other:

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2309165 A (Wheeler) - see Fig.3 and para.7 on page 1	1-4, 6 & 7 at least
X	GB 2103798 A (Ellis)	1-4 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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